Army S&T Overview .... Objective Force Munitions

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Objective Force Warrior - - -
Decisions Today for Tomorrow

Objective Force for Full Spectrum of Missions

Environmental Complexity

High

- Urban

- Open, rolling terrain

Low

Stability and Support Operations — **Small Scale Contingencies** — **Major Theater War**

Spectrum of Conflict

Increased strategic responsiveness

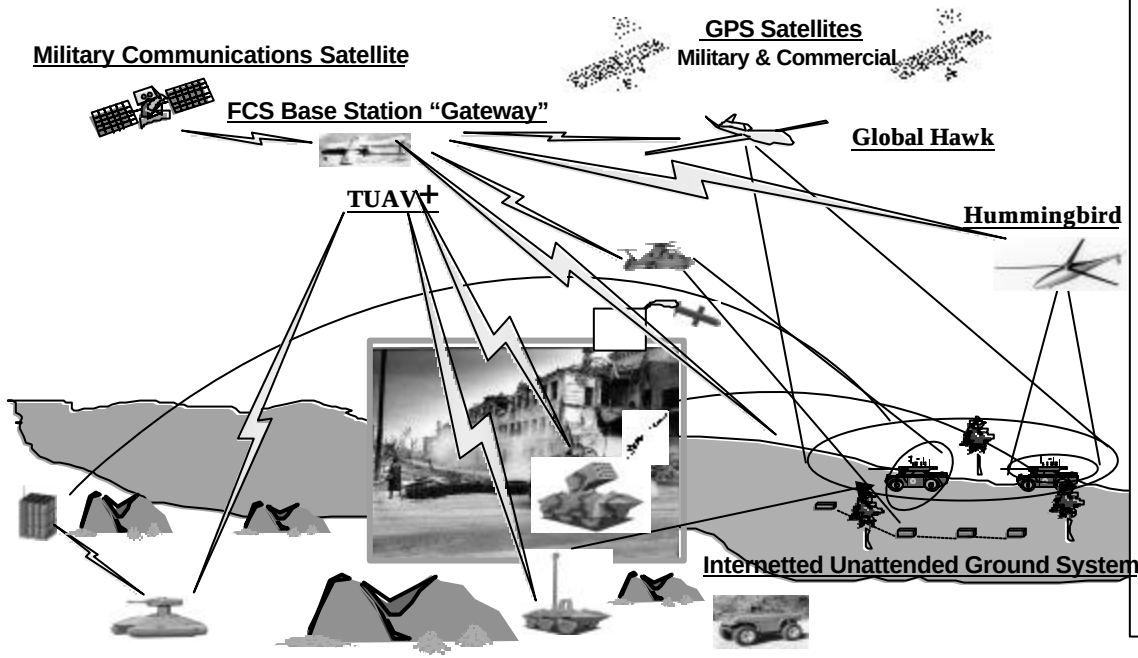
- ✓ BCT in 96 hrs; Div in 120 hrs; 5 Div in 30 days
- ✓ Fight immediately upon arrival
- ✓ Simultaneous air and sea lift

"If we can't get to the fight faster, we're not relevant."

Sec Army Louis Caldera, 6 Nov 00

Lethality and Survivability through … Network Centric Combat

Increased lethality and survivability



KNOWLEDGE

- ✓ *See with greater clarity*
- ✓ *Every attack deliberate*
- ✓ *Every engagement an ambush*
- ✓ *Inside enemy dwell time*

OVERMATCH

- ✓ *Precise targeting*
- ✓ *Assured lethality*

PROTECTION

- ✓ *Maneuver with lower profile*
- ✓ *Full spectrum active protection*
- ✓ *Advanced ballistic protection*

See First . . . Shoot First . . . Kill First

Objective Force Lethality Requires Operational and Technology Innovation

Pacing Technologies

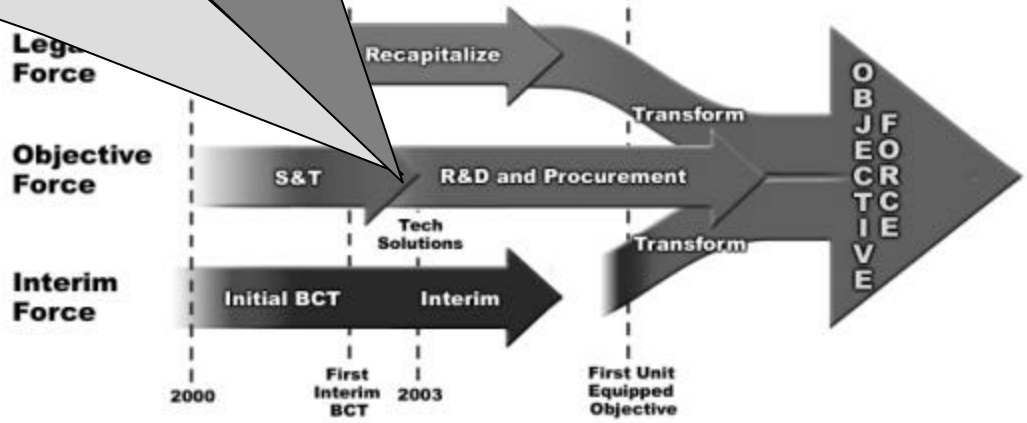
- Recoil management
- Precision Munitions
- Multi-purpose warheads
- Novel Kinetic Energy (KE) Penetrators
- Hi-G Survivable G&C
- Advanced Propulsion
- Seekers / Sensors / MEMS INS
- High Power Density

Armament Capabilities

- Rapid engagement of full target spectrum from 0 - 50km.
- Fire on the move, all terrain
- Roll-on / Roll-off from C130 aircraft
- Standoff precision lethality
- Scalable Lethality

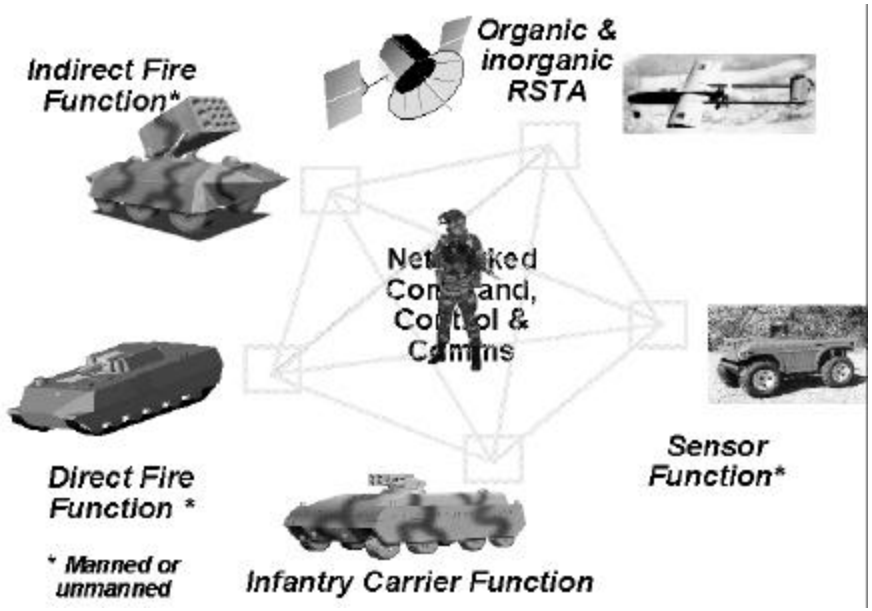
Force Capabilities

- Dominant the spectrum of military operations
- Deployable anywhere within 96 hours
- Dominate Red Zone while simultaneously shaping deep battle



Future Combat Systems

Notional Systems Construct



System of Systems Approach… not platform-centric

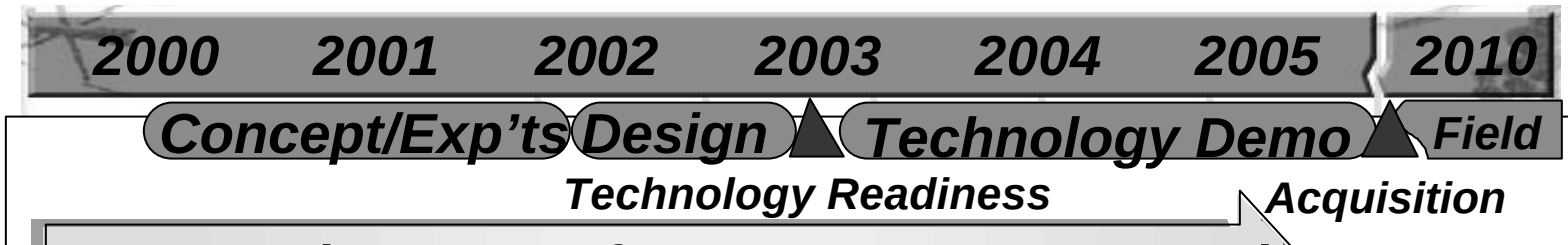
DARPA / Army Collaboration *

- ***DARPA: high risk & innovative approaches***
- ***Army: accelerates high-payoff core technologies***

**** $916M Collaborative MOA (FY00-05)***

Overwhelming Organizational Combat Power

What makes FCS so challenging?



Integrated System-of-Systems - DARPA Lead

- *Four Industrial Contractors - Concepts*
- *Two Industrial Contractors - Preliminary Design*
- *One industrial Contractor - Demonstration*

Technology Opportunities

- *Short-term, parallel DARPA / Army Development of Key Enabling Technologies*

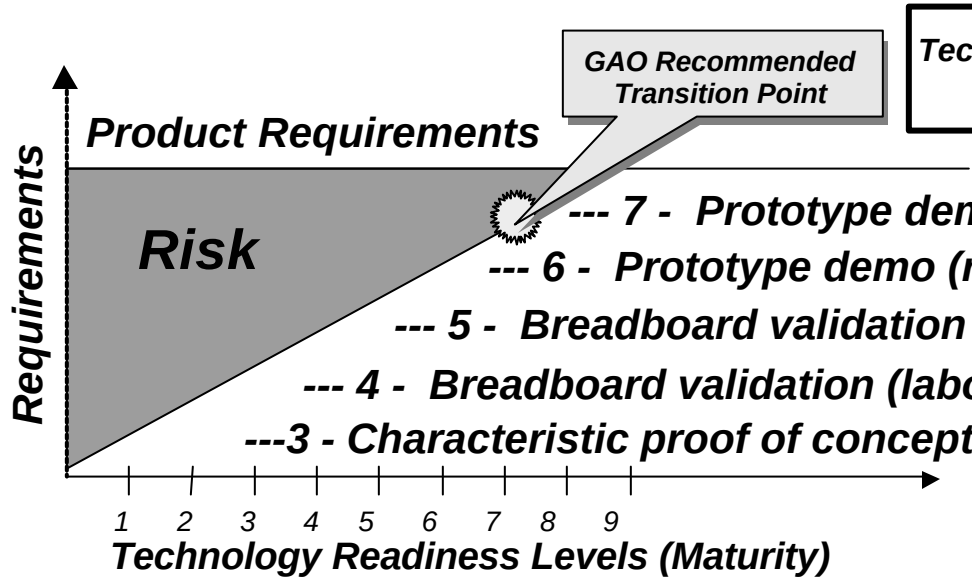
New Battle Concepts

- *Warfighter Developed Operations & Organization*

FCS Built in <u>THIS</u> Decade

Aggressive Timelines … Critical Decision in April 03

Providing Rigor In Technology Transition Management



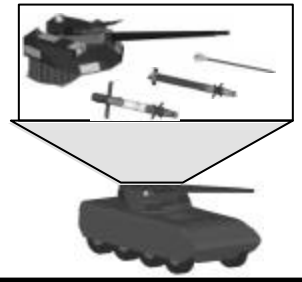
- *Technology Readiness synchronized with FCS Schedule*
  - > *TRL 5 Components/ Subsystems by Mid FY03*
  - > *TRL 6 Components/ Subsystems by Mid FY04*
  - > *TRL 6 System of System Demonstration by end FY05*

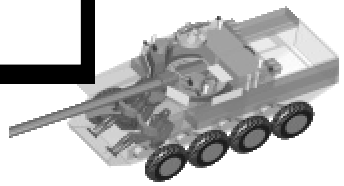
Army S&T IS using TRLs

Lethality Options for FCS

Cannons

Multi-Role Armament & Ammunition ATD

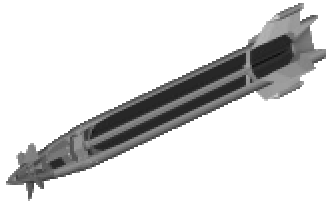




Electromagnetic Gun (E-Gun)

Missiles

Compact Kinetic Energy Missile / Hypervelocity Missile

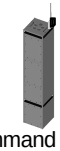


Networked Fires

Loiter Attack Missile

Precision Attack Missile

Containerized Launch Unit



Command & Control

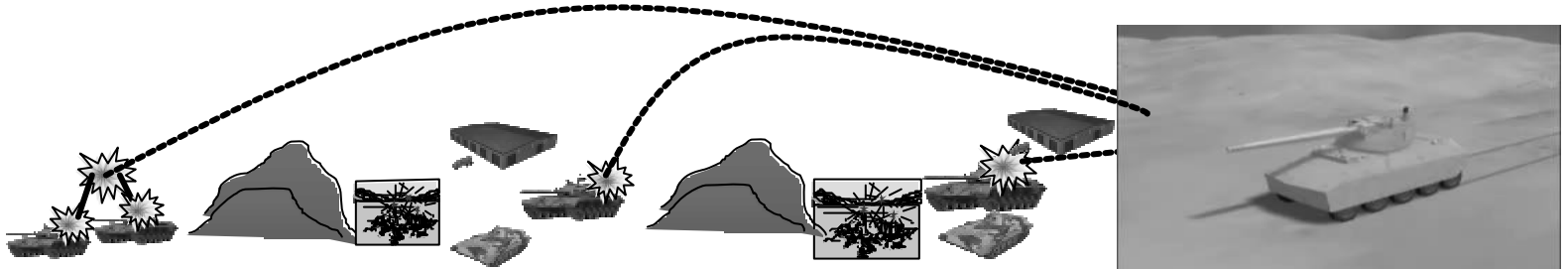
Common Missile

Mortars & Guns

RAMM

OCSW

Direct And Indirect Fire Missions In One Twenty Ton Vehicle



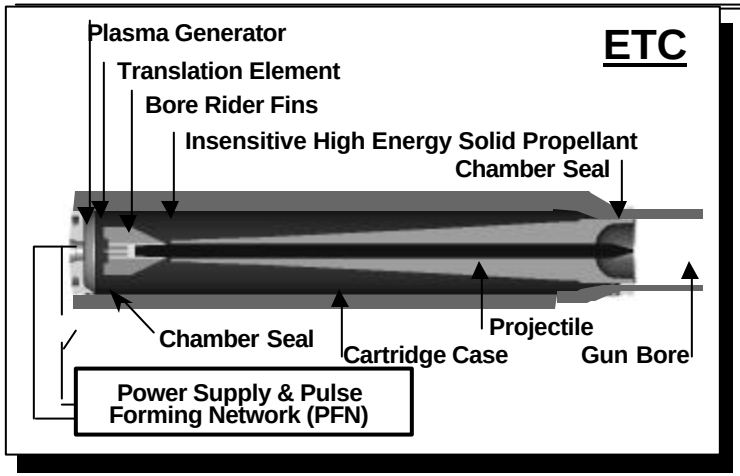
"One Shot..
....At Least One Kill"

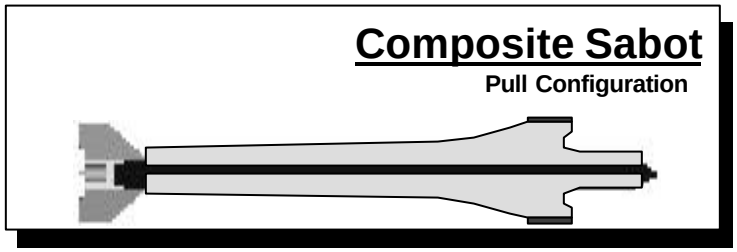
"Precision Point Target Defeat"

NLOS 4-50KM ***BLOS 2-12km*** ***LOS 0-4Km***

- **Concept Description**
  - **An armament system capable of rapidly engaging full target spectrum**
- **Pacing Technologies**
  - **<u>Electro-Thermal-Chemical (ETC) Propulsion</u> (precise ignition to support fire out of battery)**
  - **<u>Three Round Munitions Suite</u>**
    - **<u>MP-ERM with multi-purpose warhead</u> (precision delivery of multi-purpose warhead out to12km)**
    - **<u>Smart Cargo</u> (accurate delivery of bomblets, high explosive, smart submunition, etc. out to 50km)**
    - **<u>Advanced KE (</u>defeats heavy armor threats 0km – 4km)**

Advanced Kinetic Energy for Line of Sight Dominance



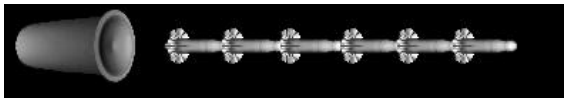


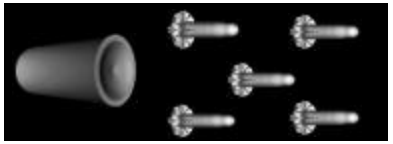
- **Challenge**
  - **Increased lethality against heavy armor at extended ranges (0-4km).**
- **Barrier**
  - **Increasing threat protection**
  - **Smaller, lighter round**
- **Solution**
  - **Advanced KE projectile**
    - **ETC**
      - **Higher muzzle energy**
    - **Composite Sabot**
      - **Lighter sabot puts more energy into rod**
      - **Goal: 55% reduction of sabot mass versus aluminum (e.g., fielded, 105mm, M900 KE projectile)**
    - **Novel Penetrator**

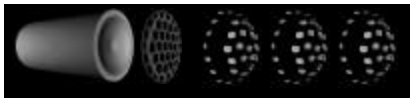
Extended Range Munitions for Beyond LOS Dominance

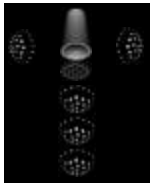
MP-ERM

Multi-Purpose Warhead









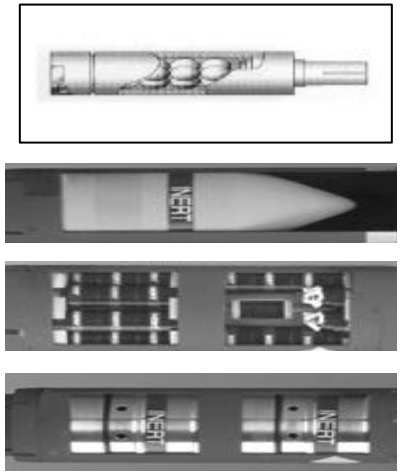
Defeats…
helicopters, personnel, heavy armor, walls, BMPs, trucks, bunkers, buildings, artillery, UAVs.

- **Challenge**
  - **Warhead effects against multiple targets with one munition type (in order to reduce logistics burden) out to 12km.**
- **Barrier**
  - **Constraining volume while increasing performance**
  - **Current warheads are optimized for particular target classes**
  - **Delivery errors of ballistic flight**
- **Solution**
  - **Precision munition**
    - **Hi-G survivable G&C**
  - **Multi-purpose warhead**
    - **More powerful explosives**
    - **Ignition circuits / selectable fuzing**

Loitering Cargo Round for Non LOS Dominance

Carrier

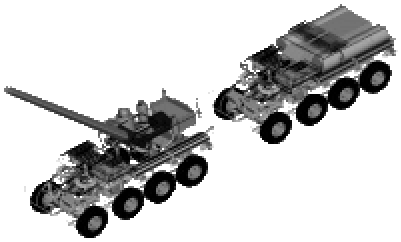
Submunition Options



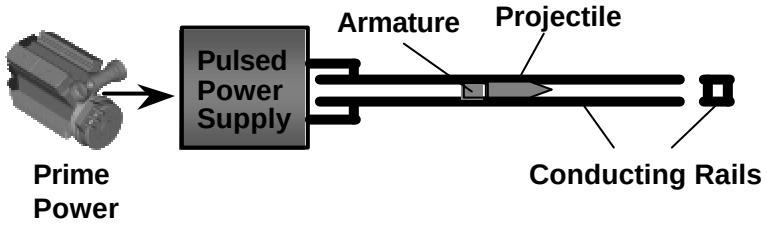
- **Challenge**
  - **Lightweight carrier round with sufficient volume to carry multiple payloads out to 50km.**
- **Barrier**
  - **Smaller round leaves less room for cargo than a 155mm cargo round**
  - **Latency of target location information due to long time of flight.**
- **Solution**
  - **Lightweight Accurate Carrier Round**
    - **Maximize payload volume**
      - **smart skin (smart materials and structures for control actuation surfaces)**
      - **Metal matrix composites for airframe**
    - **Hi-G survivability of navigation sensor and airframe (IMU, GPS/INS)**
    - **Dynamic Retargeting**
      - **Robust commo links**

Electromagnetic (EM) Gun Technology

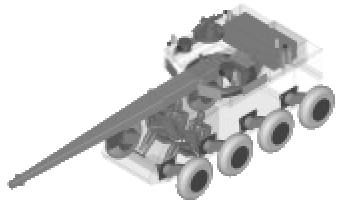
Enable lightweight future combat systems by providing <u>overwhelming lethality</u> with EM Gun



EM Indirect Fire System Concept



Replaces propellant (chemical energy) with mechanical energy Þ electrical energy



EM Direct Fire System Concept

<u>Pacing Technologies</u>:

- **Compact, efficient pulsed power**
- **Robust, efficient, long life launchers**
- **Low parasitic mass, low energy and lethal launch packages**

<u>Warfighter Payoffs</u>:

- **Increased lethality & robust defeat of all future threats**
- **Improved survivability - reduced launch signature & elimination of chemical propellant**
- **Greater sustainment - reduced weight/volume rounds**

A lethal armament for direct and indirect fire applications

Compact Kinetic Energy Missile

Line of Sight Anti-Tank (LOSAT)

Length	*9 ft 9 in*
Weight	*175 lb.*

Pacing Technologies:

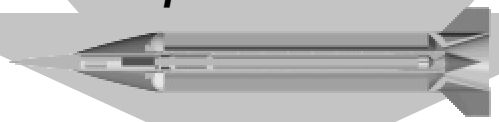
- **KE Penetrator**
- **High-g Guidance and Control**
- **High Performance, Non-Detonable Propulsion**

Increased Speed Required For Reduced Size

$$KE = \tfrac{1}{2} MV^2$$

Length	*4 ft.*
Weight	*50 lb.*

Compact KE Missile



Warfighter Payoffs:

- **LOSAT-like Lethality**
- **Large Quantity KE Stowed Kills**
- **Lightweight Quick Kill**
- **Virtually Fire & Forget (TOF < 6sec)**
- **Fire on the Move**
- **Range (0.4 – 5km) Goal (0.2 – 8km)**

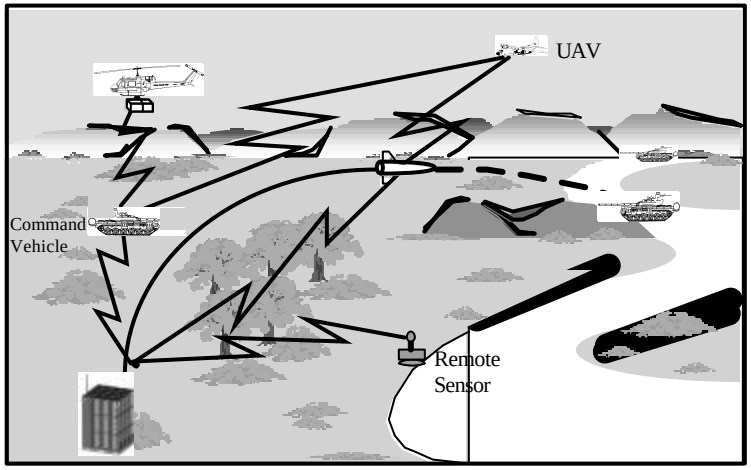
LOSAT-Like Lethality in 4 ft/50 lbs

Modernized HELLFIRE Technology Demo
(Common Missile)

Demonstrates Common Missile for Air-to-Ground Mod HELLFIRE and Ground-to-Ground TOW F&F…EMD-ready in FY04.

- **Multi-Mode Adverse Weather Seekers**
- **Fire & Forget Guidance**
- **On-Demand Propulsion With 50%- 100% Greater Range Than Current HF**
- **Important First Step Toward Common Missile for Objective Force**

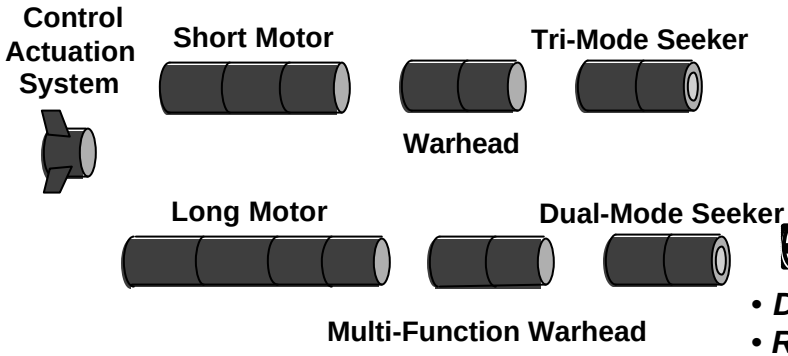
DARPA/Army Beyond Line-of-Sight Networked Fires (NetFires)



Pacing Technologies:

- Sensors
  - Uncooled IR (Precision Endgame)
  - 3-D Laser Radar (RSTA/ATR)
- Guidance and Control
  - Precision Miniature Inertial Guidance
  - Networked 2-Way Data Link
- Container
  - Plug-n-Play (Data and Power)
  - Rocket Motor Gas Management
- Propulsion
  - Solid Pintle (Variable Thrust)
  - Miniature Turbojet (Loiter)

Common Modular Missile for Multi-Mission Capability

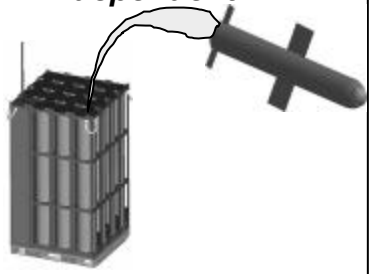


- *Close Precision*

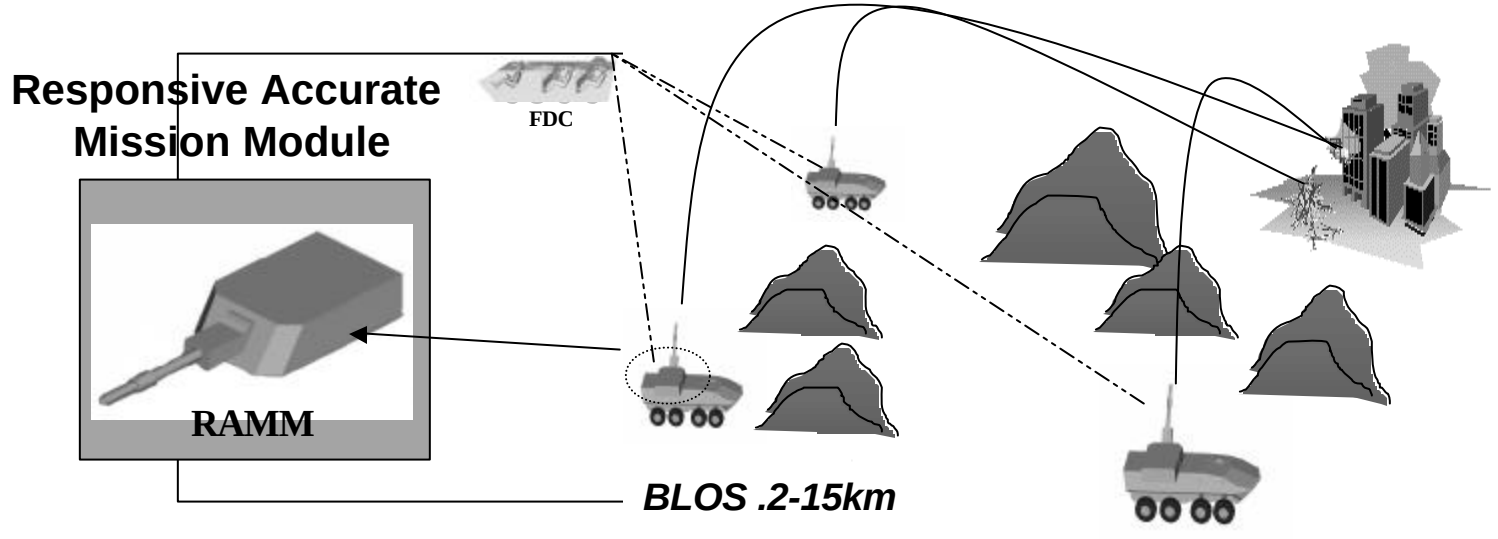
- *Deep Tactical / Loiter*
- *RSTA/Battle Damage Assessment*

Containerized for Lower Life Cycle Costs

- *Reduced Logistics*
- *Platform Independent*



Lightweight Responsive Mobile Unmanned 120mm Mortar Indirect Fire System



Pacing Technologies:

- Advanced Digital Fire Control
- Advanced Light Weight Structures
- High Speed Gun Pointing & Accuracy

Warfighter Payoffs:

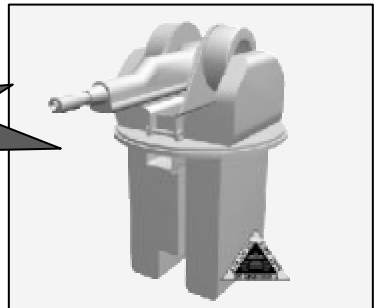
- Reduce Soldier exposure/risks
- Increase small unit lethality
- First round BLOS target effects
- Approaching indirect fire on the move

Lethality without Vulnerability

Objective Crew Served Weapon

Provide the dismounted warfighter a crew served weapon system more than 100 lbs lighter than the M2 & MK19 MGs, with <u>overwhelming lethality</u> capable of defeating protected, defilade targets & light armor out to 2000m.

60% Lighter than current systems



Candidate For Vehicle Secondary Armament FCS

50% reduction in cartridge weight

<u>*Pacing Technologies:*</u>

- *Ammunition:*
  - *- Electro Mechanical Fuze*
- *Fire Control:*
  - *- Optical Phased Array Laser Steering*
  - *- Thermal Tracking*

<u>*Warfighter Payoffs:*</u>

- *Ability to Defeat Targets in Defilade*
- *Increased Mobility & Firepower*
- *Increased Survivability & Standoff*
- *Improved Target Acquisition*
- *Full Solution Day/Night Fire Control System*
- *Reduced Crew Size*
- *Reduced Logistics Train*

Lightweight Weapon System w/ Revolutionary Lethality

Summary

- ***The path to Army Transformation <u>demands</u> responsive & deployable systems***
- ***Army S&T <u>Focus</u> is on smaller, lighter, and smarter Munitions***
- ***We are <u>doing</u> things that have never been done before***

> ***"The only thing that matters is Innovation."***
>
> **Peter Drucker**